

WHAT IS CLAIMED IS:

1. A bone anchor, comprising:
a screw portion configured to penetrate a bone, the screw portion comprising:
5 a retention thread extending at least part of a length of the screw portion; and
a tip at a first end of the screw portion;
a protrusion adjacent a second end of the screw portion, the second end opposite the first end of the screw portion, the protrusion comprising:
10 a plurality of external sides forming a shape; and
a rounded interior surface enclosing a protrusion recess, the rounded interior surface including
15 a recess thread configured to retain a component at least partially in the protrusion recess; and
the protrusion having a maximum width that is less than a maximum diameter of the screw portion such that a shoulder is formed where the protrusion meets the second
20 end of the screw portion.
2. The bone anchor of Claim 1, wherein the screw portion comprises a conical shape.
- 25 3. The bone anchor of Claim 1, wherein the screw portion further comprises at least one cutting flute extending at least part of the length of the screw portion through the retention thread.
- 30 4. The bone anchor of Claim 1, wherein the screw portion further comprises first and second cutting flutes approximately 180° apart.

5. The bone anchor of Claim 1, wherein the shape comprises a hexagonal shape.

6. The bone anchor of Claim 1, wherein the shape
5 comprises a cruciform shape.

7. The bone anchor of Claim 1, wherein the shape comprises an approximate D-shape.

10 8. The bone anchor of Claim 1, where the shape comprises an approximate square.

9. The bone anchor of Claim 1, wherein the shape comprises an approximate triangle.

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10. The bone anchor of Claim 1, further comprising a length of approximately 0.20 inch.

11. The bone anchor of Claim 1, wherein the
20 component comprises a fiducial marker component.

12. A driver for inserting a bone anchor into a bone, comprising:

a tip portion having a first diameter, the tip portion comprising:

5 a driver edge;

an external surface; and

a plurality of internal surfaces enclosing a driver recess, wherein the plurality of internal surfaces form a shape;

10 a second portion adjacent the tip portion, the second portion having a second diameter, the second diameter greater than the first diameter such that a rim is formed where the tip portion meets the second portion; and

15 wherein the tip portion positions around a protrusion of a bone anchor when the driver is used to insert the bone anchor into a bone, the driver edge contacting a shoulder of the bone anchor during insertion.

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13. The driver of Claim 12, wherein the driver recess is configured to retain an insert positioned at least partially within a threaded protrusion recess of the protrusion of the bone anchor to provide a friction
25 fit between the driver and the bone anchor during insertion of the bone anchor.

14. The driver of Claim 13, wherein the insert comprises silicon.

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15. The driver of Claim 12, wherein a distance between the driver edge and the rim is approximately

equal to a distance between the shoulder of the bone anchor and an end of the protrusion such that when the rim contacts a surface of the bone during insertion the end of the protrusion will be approximately level with
5 the surface of the bone.

16. The driver of Claim 12, wherein the shape comprises a hexagonal shape.

17. A system for inserting a bone anchor into a bone, comprising:

a bone anchor comprising:

a screw portion configured to penetrate a bone,
5 the screw portion comprising:

a retention thread extending at least part of a length of the screw portion; and

a tip at a first end of the screw portion;

a protrusion adjacent a second end of the screw
10 portion, the second end opposite the first end of the screw portion, the protrusion comprising:

a plurality of external sides forming a shape; and

a rounded interior surface enclosing a
15 protrusion recess, the rounded interior surface including a recess thread configured to retain a component at least partially in the protrusion recess when inserted into the bone; and

the protrusion having a maximum width that is
20 less than a maximum diameter of the screw portion such that a shoulder is formed where the protrusion meets the second end of the screw portion; and

a driver comprising:

a tip portion having a first diameter, the tip
25 portion comprising:

a driver edge;

an external surface; and

a plurality of internal surfaces enclosing
a driver recess, wherein the plurality of internal
30 surfaces form the shape;

a second portion adjacent the tip portion, the second portion having a second diameter, the second

diameter greater than the first diameter such that a rim is formed where the tip portion meets the second portion;

wherein the tip portion positions around the protrusion when the driver is used to insert the bone anchor into the bone, the driver edge contacting the shoulder during insertion; and

wherein a distance between the driver edge and the rim of the driver is approximately equal to a distance between the shoulder and an end of the protrusion of the bone anchor such that when the rim contacts a surface of the bone during insertion the end of the protrusion will be approximately level with the surface of the bone.

18. The system of Claim 17, wherein the driver recess is configured to retain an insert configured to position at least partially within the protrusion recess to provide a friction fit between the driver and the bone anchor during insertion of the bone anchor.

19. The system of Claim 18, wherein the insert comprises silicon.

20. The system of Claim 17, wherein the shape comprises a hexagonal shape.

21. The system of Claim 17, wherein the screw portion comprises a conical shape.

22. The system of Claim 17, wherein the screw portion further comprises at least one cutting flute

extending at least part of the length of the screw portion through the retention thread.

23. The system of Claim 17, wherein the bone anchor
5 comprises a length of approximately 0.20 inch.

24. The system of Claim 17, wherein the component comprises a fiducial marker component.

25. A method for inserting a bone anchor into a bone, comprising:

coupling a driver to a bone anchor by positioning a tip portion of the driver around a protrusion of the bone anchor such that a driver edge of the driver contacts a
5 shoulder of the bone anchor;

wherein the bone anchor comprises:

a screw portion configured to penetrate a bone, the screw portion comprising:

10 a retention thread extending at least part of a length of the screw portion; and

a tip at a first end of the screw portion;

the protrusion adjacent a second end of the screw portion, the second end opposite the first end of
15 the screw portion, the protrusion comprising:

a plurality of external sides forming a shape; and

a rounded interior surface enclosing a protrusion recess, the rounded interior surface including
20 a recess thread configured to retain a component at least partially in the protrusion recess when inserted into the bone; and

the protrusion having a maximum width that is less than a maximum diameter of the screw portion such
25 that the shoulder is formed where the protrusion meets the second end of the screw portion;

wherein the driver comprises:

the tip portion having a first diameter, the tip portion comprising:

30 the driver edge;

an external surface; and

a plurality of internal surfaces enclosing a driver recess, wherein the plurality of internal surfaces form the shape; and

5 a second portion adjacent the tip portion, the second portion having a second diameter, the second diameter greater than the first diameter such that a rim is formed where the tip portion meets the second portion;

rotating the driver such that the bone anchor penetrates and screws into the bone until the rim
10 contacts a surface of the bone, wherein a distance between the driver edge and the rim of the driver is approximately equal to a distance between the shoulder and an end of the protrusion of the bone anchor such that
15 the protrusion will be approximately level with the surface of the bone; and

decoupling the driver from the bone anchor.

26. The method of Claim 25, further comprising
20 inserting the component into the protrusion recess, the component comprising a fiducial marker component.

27. The method of Claim 25, wherein the driver recess is configured to retain an insert positioned at
25 least partially within the protrusion recess to provide a friction fit between the driver and the bone anchor during rotation of the bone anchor.

28. The method of Claim 25, wherein the shape
30 comprises a hexagonal shape.

29. The method of Claim 25, wherein the screw portion further comprises at least one cutting flute extending at least part of the length of the screw portion through the retention thread.

30. A bone anchor, comprising:

a screw portion configured to penetrate a bone, the screw portion comprising a retention thread extending at least part of a length of the screw portion;

5 a protrusion adjacent the screw portion, the protrusion enclosing a threaded recess configured to retain a component at least partially in the threaded recess; and

10 a shoulder where the screw portion meets the protrusion.

31. The bone anchor of Claim 30, wherein the component comprises a fiducial marker component.

15 32. The bone anchor of Claim 30, wherein the protrusion comprises a hexagonal shape.

33. A system for inserting a bone anchor into a bone, comprising:

a bone anchor comprising:

a screw portion configured to penetrate a bone,
5 the screw portion comprising a retention thread extending at least part of a length of the screw portion;

a protrusion adjacent the screw portion, the protrusion enclosing a threaded recess configured to retain a component at least partially in the threaded
10 recess; and

a shoulder where the protrusion meets the screw portion; and

a driver configured to engage the protrusion for insertion of the bone anchor into a bone, the driver
15 comprising:

a driver edge contacting the shoulder during the insertion; and

a rim positioned approximately level with an end of the protrusion when the driver is engaged with the protrusion such that when the rim contacts a surface of
20 the bone during the insertion the end of the protrusion will be approximately level with the surface of the bone.

34. The system of Claim 33, wherein the component
25 comprises a fiducial marker component.

35. The system of Claim 33, wherein the protrusion comprises a hexagonal shape.